CONTENTS.

VOL. II.

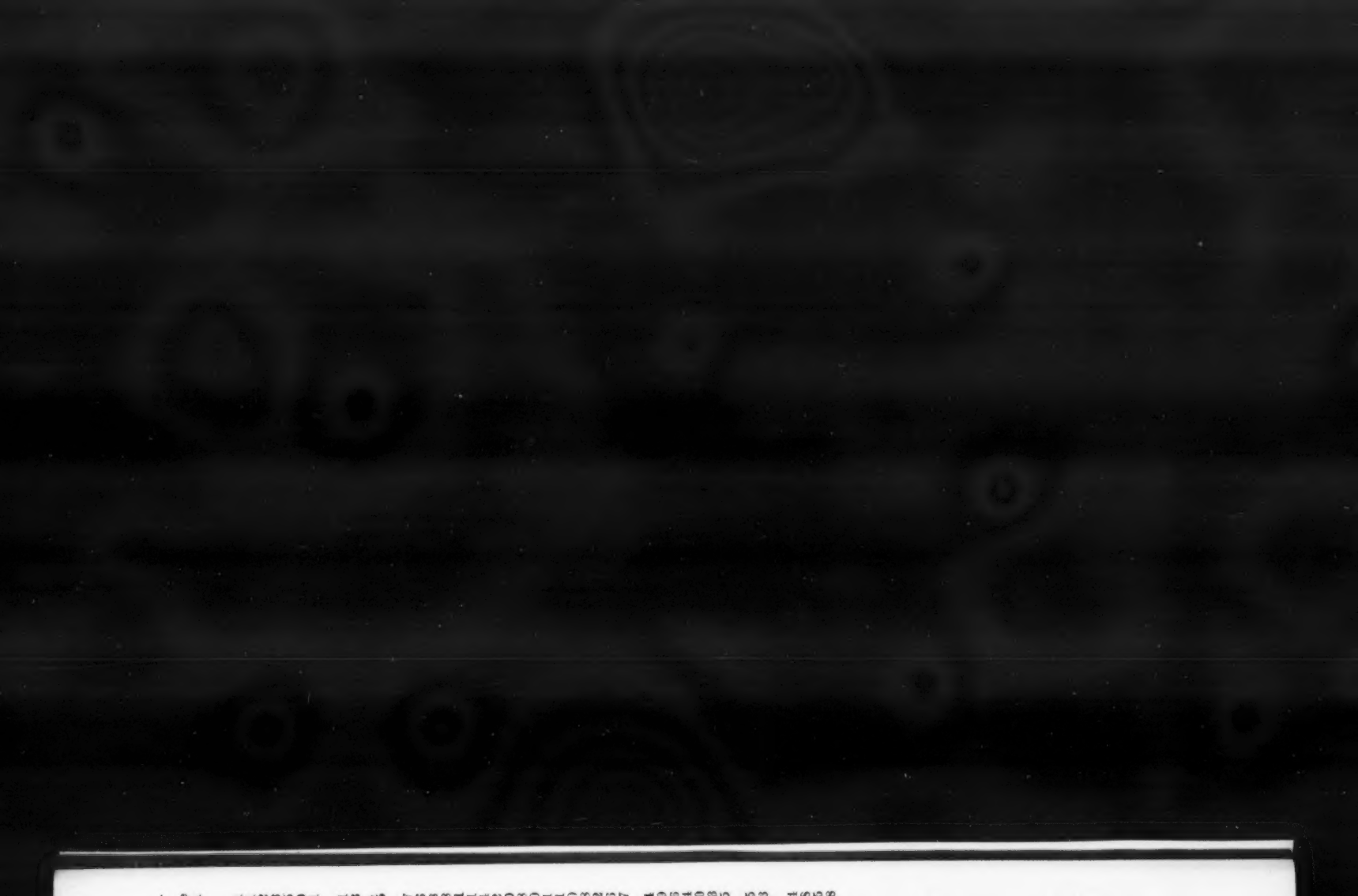
	Page
Achilles, screw steamer	219
Age of iron	77
Air in coal-gas	306
American engineers in India	50
Small arms	438
Anglo-French communication	172
Anvils	322
Apparatus for measuring velocity of shot	23
Hoisting	25
Arabian design and art	491
Arches, iron	53
For suspension bridges	221
Arched roofs	101
Architects and engineers	1
Armaments, Russian	327
Army, the Russian	6 8
Art in engineering	235
Chinese engineering	333
Artillery experiments	149
Heavy	14, 312, 369
Indian	415
Austrians and the Suez Canal	441
Austrian torpedo	325
Australian telegraph	447
Barrelled rifle	9
Batteries, electric	213, 602
Bells, something about	68
Bessemer process under pressure	225
Steel, tungsten	32
Flame spectrum	449
Steel in France	322, 508, 617
Birmingham, work in	8
Blast furnaces	380, 434
Schinz	28
Bleaching ivory	22
Blossom rock	446
Bogie engines	437
Boilers, test of	109
Repaired	123
Steel	589
New mode of setting	161
Boiler incrustation	110
Pressure	111
Furnace	162
Jacketing	271
Explosions	577, 585
Bombay to Liverpool	447
Book notices:	
Althaus. Practical chemistry	560
Barff. Introduction to chemistry	441
Binns, Wm. Orthographic projection	663
Blake. Civil engineering	443
Bourne, John. Hand-book of the steam-engine	661
Box. Treatise on mill gearing	106
Campin, Francis	664
Cook. Geology of New Jersey	559
Crafts. Quantitative analysis	443
Culley. Practical telegraphy	332, 558
Davidson. Building construction	106
Davidson, Ellis A. Elements of building, etc	662
Dunkin. The midnight sky	222
Fasci. Sea currents	569
Flint, Austin, Jr. Examination of Urine	664
Fresenius. Qualitative analysis	663
Galloway. Qualitative analysis	661
Girdlestone. Dry earth system	331
Goulier. Prism teleometer	559
Gouge, Henry A. New system of ventilation	332, 662
Guillemin. The sun	223
Harcourt. Practical chemistry	443
Hall & Dickens. Map of Treasure Hill	560
Head. A new system of fortification	106
Hergot. Cours de mecanique	106
Humphreys. Counterpoise gun carriages	105
Jeans. Navigation	560
Johnston. Physical geography	332
Joynson. Machine gearing	105
Metals used in construction	115
Kirkwood. Filtration of river waters	223
Leray. Constitution of matter	560
Lyle. What are the stars?	332
Maes, E. Traite de topographie	664
Mardon. Steam-boiler explosions	106
Merrill, Col. Iron truss bridges	332
Nicholson, Henry Alleyne. A manual of zoology	664
Orme. Introduction to science of heat	223
Osborn. Metallurgy of iron and steel	329, 441
Ortolan. Guide pratique de l'ouvrier mecanicien	106
Page. The earth's crust	106
Parville. Causeries scientifiques, etc	664
Pepper, Prof. J. H. Cyclopædic science simplified	661
Porter. Steam indicator	104
Pynchon. The chemical forces	333
Read. Invention of the tubular boiler	559
Reid. Treatise on concrete	105
Rieman. Aniline and its derivatives	443
Roebling. Long and short span bridges	106, 332
Sabine. The electric telegraph	105
Shields. Strains of iron structures	222
Stuart. The successful engineer	105
Tarn, E. Wyndham. The science of building	663
Tredgold. Carpentry	559
Trowbridge. Annual of scientific discovery	444
Tunner. Roll turning	331
Von Cotta. Ore deposits	333, 442
Ward. Lecture on ice	559
Weisbach. Mechanics	224
Winslow. Comprehensive mathematics	559
Winton. Modern workshop practice	106
Zehfuss. Pneumatic sewage system	331
Brake, railway	402
Chatelier steam	74
Bread manufacture	237
Breach-loaders	101
The Graham-Stuart	326

14794

	Page
Breakwater	104
Bridge, Boutet	439
Courcelles	153
Across the Hudson	623
At Havre de Grace	396
At Philadelphia	557
East River	439
Across the Channel	104
Louisville	128, 484
Schuylkill	504
The Channel	660
Suspension, in Texas	660
The Clifton, Niagara	318
St. Louis	10
At Prague	328
London, foundations	102
Construction in 1869	268
Bridges, long span	20
Long and short span	78
Iron	505
Burlington & Missouri R. R.	218
Buffers, hydraulic	100, 168
Building materials and appliances	262
Building railroads	534
Burning powdered coal	275
Cable towage	311
Persian Gulf	368
Caisson for East River Bridge	629
Cameron breach-loader	438
Canada Rails	216
Intercommunication	324
Canal, Darien	186, 431
Holstein	185
Proposed, at Astoria	221
Cape Cod	222
Suez	63, 329, 441
Scheme	328
Tehuantepec	440
Canal, Suez	640
Canals and rivers, motion of water in	211
Cartridge, new	22
Cars, street	325
Cast-iron, effect of sudden loads on	498
Casting metals, a new method	335
Cement for pipes	367
Kowrie	200
Channel, deepening of sea	128
Passage	31
Chatelier brake	74
Chemistry of coal smoke	335
Chimneys, wrought-iron	104
Chinese time-table	217
Chilian lime, new	437
Chicago, new tunnel in	328
Cleaning water reservoirs	111
Coal washing	337
And iron in the Far West	434
Coal fields of the North Pacific	478
Of Araranguá, S. A	576
Coal mines, temperature of	614
Working and ventilation of	255
Coal gas, air in	306
Effect of temperature on	567
Coal, powdered, burning of	275
Coating wood	171
Coke, manufacture of	516
Coke, iron, and charcoal-iron	568
Combustion of gunpowder	45
Comparison of turbines with other water wheels	364
Concrete stone in India	142
Construction of Wolf Rock Lighthouse	616
Materials for, in Europe	543
Corrosion of ship plates	476
Corinth, Isthmus of	376
Cost of steam-power	250
Counterbracing	426
Coupling for railway cars	555
Croton water, purity of	618
Lead in	464
Crucible steel manufacture	429
Cutting and Filling	536
Dam at Holyoke	441
Decoration, mural	71
Deepening sea channels	128
Depot on Fourth avenue	659
Derailment of railway trains	590
Detroit river tunnel	38
Devastation, the	100
Determination of evaporation from water surface	143
Difficulties in received views of fluid friction	480
Diseases, zymotic	68
Distances, measurement of, by the level	239
Dualin	447
Dynamometer, new	228
Earthworks	532, 536
Earthquake-proof church	470
Economical steam-engines	406
Economical purification of zinc	308
Effect of sudden loads on cast-iron	498
Effect of sunlight on glass	336
Effect of temperature on coal-gas	567
Ejector condenser	448
Elasticity in track and rolling stock	509
Electric batteries, intensity of	213
Elevated railway	640
Emery	448
Engineering, art in	235
Chinese	333
Mechanical, in 1869	259
Progress	150
In America in 1831	336
In North Germany	497
Engineering of the Union Pacific Railway	642
Engineers in India	50
Engines, economical	406
Hot air and rotary	76
Improved piston for	191
Rotary	206
The Fairlie	233, 540, 593
Portable condensing	295
Performances of	501
Perkins' compound	624
Equilibrium of floating bodies	514
Estimating earthworks	532
Evaporation from water surface	143
Excavator, steam	328
Exhaust steam for heating	537
Explosive compound, safety	247
Explosive agents	524
Experiments on iron beams	561
Expansion of iron	576
Fairlie engines	233, 380, 540, 593
Feeding steam boilers	667
Festiniog Railway	216, 548
Filtration of water	46
Influence of rain	569
Filtering	374
Floating bodies, equilibrium of	514
Fluid friction	480
Foundations of London Bridge	102
In marshes	103
Fourneyron turbine	475
France, Bessemer rails in	216
Steel in	322, 508
French iron trade	215
Public works	439
Franco-Egyptian telegraph	519
Furnace boilers	162
Furnace for melting steel	214
Shinz blast	28
Gas, use of, as fuel	405
Gas stove at Edinburgh Observatory	351
Gauge, uniformity of	435, 581
Geological relations of iron	17
Girders, King's College	471
Glass, effect of sunlight on	336
Glue to unite steel	333
Glycerine	582
Gunboats, the Spanish	113
Gun, new twenty-inch	37
Whitworth	506
Six hundred pound	327
Experiments	432
Carriage, Moncrieff	327, 437
Guns, Pallisser, converted	219
Of the "Hercules"	301
Crash of the	503
Hogan process	272
Hammer, operating tilt	201
Heat, note on early history of	207
Heating with liquid fuel	60
Exhaust steam	537
Heat paradox	333
Heat, the moon's	336
Heaton's steel process	84, 129, 241
High class steam-engines	378
Holstein intermaritime canal	185
Hoisting apparatus	25
Stone in quarries	496
Hot air and rotary engines	76
"Hotspur," the steam life-ship	557
How rails are made in France	521
How heat disappears behind a piston	147
How to make screws hold	487
Human heart, the laboring force of	229
Humber, extraordinary scene on	327
Hydraulic joints	202
Machinery for grain	182
Buffers	100, 168
Riveting machine	520
Hydrostatic test	109
Ice-making in the South	665
Ice, bearing qualities of	667
Illuminating power of different substances	397
Incrustation in boilers	110
Indicator, continuous	9
Indian statistics	187
Indian field artillery	415
International communication	414
Iron arches	53
Bridges	505
Beams, experiments on	561
Chimneys	104
Dephosphorization of	322
Coke, and charcoal, geological relations of	17
For railways	552
Iron and steel experiments	210
Trade	433, 552
Crystals	215
Iron trade, French	215
Prussian	408

	Page
Iron ore	321
In Great Britain	216
Malleable	216
Works of Terre Noire	321
Ships and shipbuilding	357
Rust, prevention of	434
Iron and quicksilver	336
Ironclads, present and future	556
Isthmus of Corinth	376
Ivory bleaching	22
King's College girders	471
King's Cross Station roof	394
Labor in building, waste of	511
Laboring force of the human heart	229
La Ciotat	158
Last scheme for uniting England and France	439
Lead mines of Missouri	504
Lead in Croton water	464
Lead pipes, action of sewage on	298
Levelling and surveying in China	108
Light-houses	54, 107, 616
Liquid fuel for locomotives	60
"Little Wonder," locomotive	265
Locomotive piston	238
Wheels	437
Locomotives, traction of	427
Wetli system of	488
Fairlie	233, 540, 593
Mountain	597
London water supply	80
To Pekin by rail	99
Pavements	240
Long and short span bridges	248
Louisville Bridge	128, 484
Lubricator, Melene	448
Machine, water column	304
Bearings	601
Madrid water works	490
Malleable cast-iron	122, 381
Manganese compounds in glass	445
Manufacture of crucible steel	429
Piles, fagots, or billets of iron	7
Pipes	11
Iron and steel	98
Coke	516
Marbles	591
Marshes, foundations in	103
Marquette mining region	289
Materials, building	262
For construction in Europe	543
Strength of	33, 65
Medals, Rumford	266
Measurement of distances by the level	239
Mechanical engineering in 1869	259
Melene	448
Merchant marine, the	112
Methods of surveying	366
Metallic zinc	164
Metal, Whitworth	42
Metals, new method of casting	335
Metric system	31
Military maps, Prussian	380
Mineral oils, French, report on	325
Mining region, the Marquette	289
Mining statistics, British	38
Experiments	160
Mines, Russian	547
Lead, of Missouri	504
Asphalte, of Pyrimont	197
Moncrieff gun carriages	327, 437
Moon's heat	386
Motive power, improvement in	55
Motor, the tide	231
Mortar joints	510
Mountain locomotives	597
Mural decoration	71
Narrow-gauge railways in Sweden	499
National progress	446
Navigation	659
New breakwater	104
New gas stove	351
New gunpowder	439
New water meter	472
Nitro-Glycerine explosions	367
Notes on the Great Pyramid	382
Ocean telegraph	445
Ocean telegraphy	665
Oil of Vitriol	445
Optical correction in design	106
Ordnance experiments, Russian	384, 425
Orlando, the	658
Oudh Canal	103
Outflow of steam	116
Oxygen gas	336
Paint, lead, use of	627
Pallisser converted guns	219
Papier maché church	667
Paris water supply	309
Parliament houses, stonework	595
Pavements, London	240
Performances of engines	501
Perkins' compound engines	624
Photography applied to surveying	189
Physical commotion throughout the globe	110
Piles, fagots, etc., of iron	7
Screw	440, 530
Pillars, long and short	248
Pipes, manufacture of	11
Pipe-joint, new	333
Piston, improved	191
Porphyry, artificial, from iron slag	216
Power, improvement in	55
Practice with the transit	619
Presentation of Rumford medals	266
Preservation of stone	112
Pressure in steam boilers	111
Of the wind	574
Process, the induration	329
The Hagan	272
The Heaton	84, 129, 241
The Ransome	184
Wheeler's steel-iron	416
Projectiles, deviation of	547
Propelling ships	154
Properties of malleable iron	381
Prospect Park well	220
Prussia, railway accidents in	183
Iron trade	408
Pump, the spiral	193
Pumping money	253
Punching metals	444
Pyramid, the Great	149, 382
Quicksilver and iron	336
Quicksilver bottles	473
Rail sections	434
Tests	412
Rails in Canada	216
In France	216, 521
Steel and steel-headed	100
Railway construction	524, 534
Railway, Russian	324
Central Pacific	323, 436
Japan	324
Massachusetts, report	361
Penobscot Bay	324
In Victoria	413
The Festiniog	216, 548
British Pacific	529
South Pacific	436
The Black Forest	288
Union Pacific, snow on	218
Mont Cenis	322
French	217
Railway brakes	402
Bridge at Havre de Grace	396
Trains, derailment of	590
Oscillation of	38
Resistances	139
Traffic, English	186
Gauge, uniform	581
Accidents in Prussia	183
Elevated	640
Railways, American	555
European	436, 529
In Russia	126
In United States	436, 554
Pennsylvania	435
Narrow-gauge, in Sweden	499
At Hokendaqua, damages by	617
Narrow gauge	656
American	656
Belgian	657
Turkish, new	658
Switzerland	658
Of United States	658
Rain, distribution of	299
Influence of, on filtration	569
Ransome process	184
Relative illuminating power	397
Repaired boilers	126
Report on boiler explosions	577
Sewage experiments	155
Massachusetts Railway	361
Resistance of vesse's	276, 386, 465
Rifles, the Martini-Henry	327
Rivers, self-purification of	638
Riveting machine, hydraulic	520
Road steamers in Paris	38
Rock Island palace car	434
Roof, King's Cross Station	394
Rotary engines	76, 206
Russian Exhibition of 1870	258
Armaments	327
Army	658, 659
Line of steamers	128
Ordnance experiments	384
Safety lamp	271
Saturation point of steam	354
School, central, of Paris	302
Screw piles	440, 530
Screw-steamer "Achilles"	219
Sea, temperature of the	334
Second Persian Gulf cable	368
Self-purification of rivers	638
Sewage experiments in Paris	155
Treatment of, at Rheims	398
And the land	588
Action of, on lead pipes	298
Question	665
Shellac varnish	31
Ship-building	649
Ship canal across Cape Cod	222
Shoeburyness experiments	219
Shot, velocity of	23
Shrinking of timber	39
Sidney water supply	661
Silt embankments	583

	Page
Sinking screw piles	440
Siphon discharge	112
Siphon and suction pump	641
Slag brick	529
Solar heat, utilization of	60
Solutions for hardening steel	444
Something about bells	68
Somerset House accident	273
Sound experiments at Chicago	477
Spanish gunboats	113
Spectrum of Bessemer flame	449
Fire-fly	448
Spectroscopic observations	307
Spiral pump	193
Stability of Arches	636
Statistics, Indian	187
Steam brake	74
Outflow of	116
Saturation point	354
History of	647
Power, cost of	250
Engines, high class	378
Steamers for roads in Paris	38
Steel boilers	589
Process, Heaton's, 84,	129
Wheeler's	416
Rails	97
Puddling	433
Making in Pittsburg	99
Manufacture 433, 552,	592
Steel and iron	656
Steel, hardening of	444
Stone, preservation of	112
Stone-work of Houses of Parliament	595
Concrete, in India	142
Strength of materials	65
Of rolled sections of iron	648
Of unstayed surfaces	220
Stump-drawing by steam	333
Submarine warfare 409,	630
Sunlight, action on sulphuric acid	335
Suez Canal 63, 64,	640
Surveying instruments	5
Methods	366
Application of photography to	189
Sweden, narrow gauge railways in	499
Switzerland Railway	658

	Page
Team, a wonderful	217
Telegraph, ocean	445
Russian submarine	188
Batteries and conductors	602
Franco-Egyptian	519
In the East	571
Pacific	667
Telegraphy, ocean	665
Temperature, mean annual	447
Of coal mines	614
Effect of, on coal-gas	567
Test, hydrostatic, of boilers	109
Thames, under the	69
The Hagan process	272
"The Little Wonder"	265
The tide motor	231
"The Iron Duke"	659
The age of iron	77
The Line to Salt Lake City	383
Thermo-electric pile	224
Tilt-hammer	201
Timber, contraction of	39
Rendered incombustible	52
Cutting and climate	138
Tin in Missouri	224
Torpedo, Austrian	325
The Harvey	512
To make screws hold	487
Towage, wire cable	311
Track and rolling stock	509
Traction of locomotives	427
Trains, oscillation of	38
Tramways, street	664
English	629
Wire	323
Wire-rope	535
Transit practice	619
Transits of Venus	64
True basis for construction of heavy artillery	369
Tunnel, Detroit River	38
Cleveland Lake	44
New, at Chicago	328
Mount Cenis 328,	440
Tunneling	660
Tunnels of the Pacific Road	418
Tungsten Bessemer steel	32
Turbines compared with other water-wheels	364
Turbines, Tourneyron	475
Turkish railways	658

	Page
Turning the river Exas	661
Uniform motion of water in canals and rivers	211
Uniformity of gauge 435,	581
Union Pacific engineering	642
United States railways	658
Use of gas as fuel	405
Utilization of solar heat	60
Iron slag	41
Varnish, shellac	31
For iron	333
Vessels, The resistance of 276, 386,	465
Walls, bulging of	557
Water filtration	46
Supply, London 80,	448
Paris 309,	448
Sydney	661
Reservoirs, cleaning of	111
Column machine	304
Meter, new	472
Water-works of Madrid	490
Water, purity of Croton	618
Warfare, submarine 409,	630
Waste of labor in building	511
Weights and measures	31
Well at Prospect Park	220
Wetli system of locomotives	488
Whitworth metal	42
Gun	506
Wind, velocity of	297
Pressure on bridges and roofs	574
White lead manufacture	399
Wheeler's steel-iron process	416
Who invented the steamboat?	474
Wire-rope	500
Wire tramways	323
Wire-rope tramways	535
Working and ventilation of coal mines	255
Wrought-iron and steel	423
Zinc, history of	164
Purification of	308
White	445
Zymotic diseases	68